Solving Systems of Linear Equations

*A system of equations is solved by finding the _____ (if any) that they share.
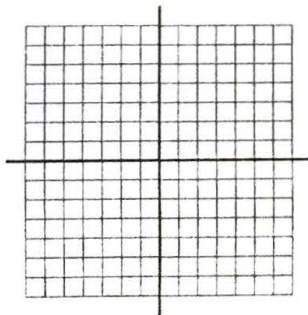
*A system of _____ equations share either __, _____, or ___ points.

*A system of linear equations can be solved using one of four methods.

TYPE	DEF'N	WEAKNESSES
I. Graphing		
II.. Table		
II. Substitution		
III. Linear Combination (Elimination)		

Examples of types I, II, III, and IV.

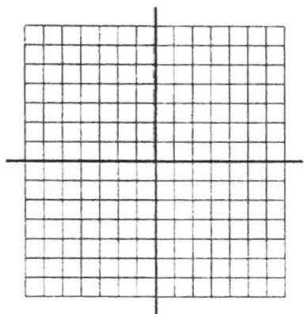I. $\begin{cases} x - y = 0 \\ 2x + y = 3 \end{cases}$

II. $\begin{cases} x - y = 0 \\ 2x + y = 3 \end{cases}$ (use the table)

_____

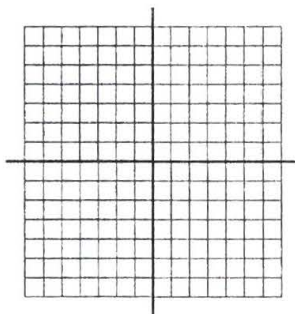III. $\begin{cases} x - y = 1 \\ x + 2y = 7 \end{cases}$ _____

IV. $\begin{cases} 3x + 4y = 20 \\ 4x + 5y = 10 \end{cases}$ _____

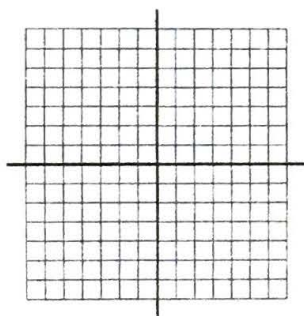**Solve the following systems by graphing. Check your answers using a table.**

1. $\begin{cases} y = 2x + 3 \\ y = -5x - 2 \end{cases}$

2. $\begin{cases} y = 3x - 3 \\ y = 3x + 1 \end{cases}$

3. $\begin{cases} 2y = 4x - 6 \\ 4y = 8x - 12 \end{cases}$

4. $\begin{cases} y = \frac{1}{2}x + 4 \\ 2y = x - 6 \end{cases}$
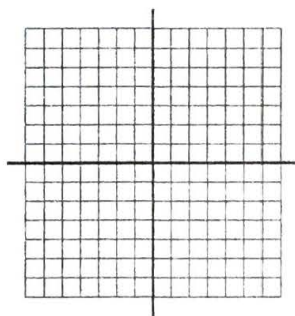
5. $\begin{cases} x + y = 1 \\ -x + y = 1 \end{cases}$
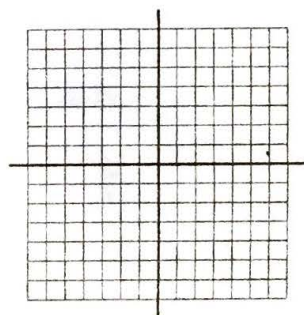
6. $\begin{cases} x - y < 0 \\ x + y > 1 \end{cases}$
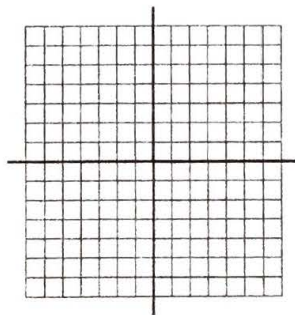
Solve the following systems using linear combination.

7. $\begin{cases} 2x + 7y = 40 \\ 2x - 3y = 20 \end{cases}$

8. $\begin{cases} -3x + 4y = 7 \\ 2x + y = -1 \end{cases}$

9. $\begin{cases} 8x = -1 \\ -3x + y = -4 \end{cases}$

10. $\begin{cases} -x - y = 6 \\ 7x - 3y = 18 \end{cases}$

11. $\begin{cases} 11x + 2y = 27 \\ 21x + 3y = -9 \end{cases}$

12. $\begin{cases} 3x - 8y = 10 \\ -21x + 56y = -84 \end{cases}$

Use systems to solve the following problems. The choice of method is up to you. Use an alternate method to check your answers.

I.   Some coins (dimes and nickels) are in a pile. The total
     value of the pile is $1.35. The number of nickels is one
     coin less than twice the number of dimes. Using a system
     of equations, find the number of each type of coin.

                                                          _____

II.   The larger of two complementary angles is 12 more than
     5 times the measure of the smaller. Find the measure of
     the two angles.

                                                           _____

III.   You are searching for two integers. The sum of twice the
     first integer and three times the second integer is nine. At
     the same time, the sum of three times the first integer and
     twice the second integer is one. Find the two integers.

How do you find the solution to a system of linear equations?

$$2x + 3y = 5$$
$$4x - y = 17$$

Methods to Solve Systems of Linear Systems

SYSTEMS OF EQUATIONS

GRAPHING

1. Graph Line 1.
2. Graph Line 2.
3. Visually identify the point of intersection.

Intersecting lines have exactly one solution which is the point of intersection

(x, y)

Parallel lines have no solution because there is no point of intersection

$\emptyset$

Coinciding lines have an infinite number of solutions (all the points on the line are solutions of the system)

$(x,y)|y=mx+b\}$

SUBSTITUTION

1. Isolate one variable in one of the equations.
2. Substitute that expression into the second equation and solve for the variable.
3. Substitute the value found in step 2 into either of the original equations and solve for the remaining variable.
4. Write the ordered pair.

What if both of the variables cancel out? Look at the resulting arithmetic equation.
 *False statement indicates the lines are parallel so there is no solution.
 *True statement indicates the lines coincide so there are infinite solutions.

Graphic Organizer by Dale Graham and Linda Meyer
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Elimination

1. Rewrite each equation in standard form.
2. Choose a variable to eliminate and multiply by appropriate number to eliminate it.
3. Solve for remaining variable either by substituting into one of the original equations or by repeating step 2 for the other variable.
4. Write the ordered pair.